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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/585,806	07/01/2008	Kengo Nishi	YAM-122	6157

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EXAMINER	
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ART UNIT	PAPER NUMBER
3783	

MAIL DATE	DELIVERY MODE
03/30/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/585,806	NISHI ET AL.	
	Examiner	Art Unit	
	LONG TRAN	4165	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7 March 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 - 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12 July 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 1 – 4, and 10 – 11 rejected under 35 U.S.C. 103(a) as being unpatentable Kageyama (JP-A-250597).

Regarding Claim 1:

Kageyama discloses an in-line four-cylinder engine for a vehicle including a crankshaft having first crank pins of two cylinders, wherein the first crank pins are provided on a common first virtual plane and are arranged with a 180 degree phase difference, and having second crank pins of another two cylinders, wherein the second crank pins are provided on a second virtual plane different by a 90 degree phase from the first virtual plane and are arranged with a 180 degree phase difference, the in-line four-cylinder engine comprising: a crankshaft (6) satisfying a

formula with an obvious variance, wherein when a crank web for each of at least two cylinders is divided between a pair of half crank webs facing a crank pin, and a primary balancer for generating a couple vector offsetting a vector of the first inertia couple (11).

Kageyama does not disclose the crankshaft of the claimed formula:

$(k_L – 0.25)*(0.25 – k_R) = D_R / D_L$, wherein

K = balance ratio, which equals $(M – W_{rot} * r/2) / (W_{rec} *r)$;

M = total unbalanced quantity of crank web, (g*mm), which is the moment;

r = rotational radius of W;

W_{rot}= mass for rotating portion, grams;

W_{rec} = mass for reciprocating portion, grams;

D = distance from center of crankshaft to half crank web;

and 0.25 can be interpreted as the positive constant to maintain a ratio within a 0 – 100% ratio.

However, Kageyama discloses a 4 cylinder arrangement based on a widely adopted arrangement of 0 degree for the 1st cylinder, 90 degrees for the 2nd, 270 degrees for the 3rd, and 180 degrees for the 4th. Also included is Formula 8 in paragraphs 0022 and 0036 that describe the same common variables used to balance a crankshaft wherein:

$Mz1 = - 1/2mr^2wsin (2\theta$ + cylinder number), where

Mz1 = primary inertia force set to 0

m = mass

w = angular velocity

r = crank throw, or radius

By setting the rotating part mass to be A+B = 1 (paragraph 0022) from ½ of both way partial mass of each cylinder. And B equate to the ratios showing a share rate of rotating part mass of a crankshaft, a 100% value similar to the claimed invention's formula. Here, the mass and radius satisfy the moment calculation, and the angular velocity is derived from the rotation radius. The product of the weight and rotational radius are the basis for the balance ratio K used in the claimed invention. The distances of D from the center of the crank to the half crank web is outlined in Figure 2. One skilled in the art can infer that a half crank web can be measured within a crank web, and that it would have been obvious to reduce the number of variables in such a way as to allow the crankshaft to satisfy the formula in an efficient manner.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the balance ratio formula by setting the crank angle to 0, and generate a moment of the balancer shaft of a uniform opposite direction. The degree of design freedom of balance ratio, inertia mass and the like of a crank web can be increased since a half crank web for each cylinder can be changed in shape, so that the engine can be made compact. Therefore, the variant formula used in the claimed invention can be derived by the balancer in Kageyama.

Regarding Claim 2:

Kageyama discloses the in-line four-cylinder engine for a vehicle, wherein (k.sub.L+k.sub.R) for at least a part of the cylinders is less than 0.5 (paragraph 0050).

Regarding Claim 3:

Kageyama discloses the in-line four-cylinder engine for a vehicle, wherein (k.sub.L+k.sub.R) for at least a part of the cylinders is more than 0.5. (Paragraph 0050).

Regarding Claim 4:

Kageyama discloses the in-line four-cylinder engine for a vehicle, wherein two cylinders satisfy a condition in claim 1 and both of the balance ratios k.sub.L and k.sub.R of the other two cylinders are set at 0.25 (paragraph 0014).

Regarding Claim 10:

Kageyama discloses the in-line four-cylinder engine for a vehicle, wherein the primary balancer is provided parallel to the crankshaft, and balance weight is provided at a location opposite to the crank pins of the second and third cylinders or at a location opposite to the crank pins of the first and fourth cylinders (paragraph 0013).

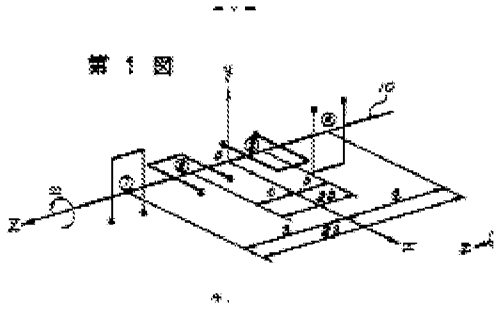
Regarding Claim 11:

Kageyama discloses a vehicle provided with the in-line four-cylinder engine for a vehicle (Figure 4).

3. Claims 5 – 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kageyama (JP-A-9-250597) and in view of Shimada (JP-A-57-69137)

Regarding Claim 5:

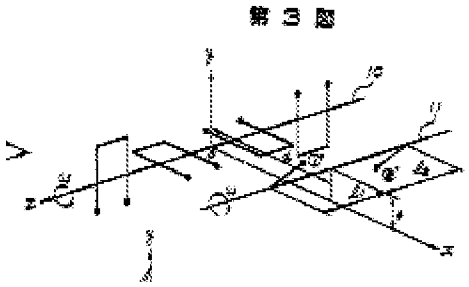
The in-line four-cylinder engine of Kageyama meets all of the claimed limitations except wherein the crankshaft has crank pins of the first and fourth cylinders located on the first virtual plane, and crank pins of the second and third cylinders located on the second virtual plane, when the first to fourth cylinders are provided in this order from an end. However, Shimada discloses a balancer for a four-cylinder engine wherein the crankshaft has crank pins of the first and fourth cylinders located on the first virtual plane, and crank pins of the second and third cylinders located on the second virtual plane, when the first to fourth cylinders are provided in this order from an end (Figure 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the crankshaft on the disclosed plane as taught by Shimada in the in-line four-cylinder engine of Kageyama in order to reduce vibrations and to completely eliminate the primary and secondary inertial forces and inertial couple.



Regarding Claim 6:

The in-line four-cylinder engine of Kageyama meets all of the claimed limitations except wherein the crankshaft has crank pins of the first and third cylinders located

on the first virtual plane, and crank pins of the second and fourth cylinders located on the second virtual plane. However, Shimada discloses a crankshaft having crank pins of the first and third cylinders located on the first virtual plane, and crank pins of the second and fourth cylinders located on the second virtual plane (Figure 1 and Figure 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the crankshaft on the disclosed plane as taught by Shimada in the in-line four-cylinder engine of Kageyama in order to reduce vibrations and to completely eliminate the primary and secondary inertial forces and inertial couple.



Regarding Claim 7:

The in-line four-cylinder engine of Kageyama meets all of the claimed limitations except wherein the crankshaft has crank pins of the first and second cylinders located on the first virtual plane, and crank pins of the third and fourth cylinders located on the second virtual plane. However, Shimada discloses a crankshaft having crank pins of the first and third cylinders located on the first virtual plane, and crank pins of the second and fourth cylinders located on the second virtual plane (Figure 1 and Figure 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the crankshaft

on the disclosed plane as taught by Shimada in the in-line four-cylinder engine of Kageyama in order to reduce vibrations and to completely eliminate the primary and secondary inertial forces and inertial couple.

Regarding Claim 8:

The in-line four-cylinder engine of Kageyama meets all of the claimed limitations except wherein balance ratios k.sub.L and k.sub.R and distances D.sub.L and D.sub.R of half crank webs of the respective cylinders are symmetrical between the first and fourth cylinders and symmetrical between the second and third cylinders. However, Shimada discloses the balance ratio of half crank webs of the respective cylinders is symmetrical between the first and fourth cylinders and symmetrical between the second and third cylinders (Figure 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the crankshaft on the disclosed plane as taught by Shimada in the in-line four-cylinder engine of Kageyama in order to reduce vibrations and to completely eliminate the primary and secondary inertial forces and inertial couple.

Regarding Claim 9:

The in-line four-cylinder engine of Kageyama meets all of the claimed limitations except wherein the distances D.sub.L and D.sub.R are symmetrical between the first and fourth cylinders and between the second and third cylinders while the balance ratios k.sub.L and k.sub.R of half crank webs are symmetrical between two arbitrary combined cylinders. However, Shimada discloses the distances D.sub.L and

D.sub.R are symmetrical between the first and fourth cylinders and between the second and third cylinders while the balance ratios k.sub.L and k.sub.R of half crank webs are symmetrical between two arbitrary combined cylinders (Figure 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the crankshaft on the disclosed plane as taught by Shimada in the in-line four-cylinder engine of Kageyama in order to reduce vibrations and to completely eliminate the primary and secondary inertial forces and inertial couple.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LONG TRAN whose telephone number is (571)270-1899. The examiner can normally be reached on M-F, 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael A. Cuff can be reached on (571)272-6778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LONG TRAN/
Examiner, Art Unit 4165

/Michael Cuff/
Supervisory Patent Examiner, Art Unit 3783